

Utilizing Project BOOST (Bridging Outcomes in Operational & Strategic Thinking) to Improve Operational Competence and Strategic Thinking Among at-Risk Grade 7 Learners

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DOI: <https://doi.org/10.47772/IJRISS.2026.100800813>

Received: 02 September 2026; Accepted: 07 September 2026; Published: 18 September 2026

ABSTRACT

The purpose of the study was to assess the utilization of project BOOST (Bridging Outcomes in Operational & Strategic Thinking) to improve the operational competence and strategic thinking of at-risk Grade 7 learners. Specifically, it aimed to determine: (1) what are the pre-test and post-test scores of the participants in terms of operational competence and strategic thinking; (2) if there is a significant difference between the pre-test and post-test scores of the participants following the implementation of Project BOOST; and (3) based on the findings of the study, what instructional intervention program can be proposed to institutionalize the mastery of fundamental operations and strategic thinking among the at-risk students.

The study used a one-group pre-test, post-test quasi-experimental research design where the subjects were 35 purposely selected at-risk Grade 7 learners who underwent the 15-day intervention under DepEd ARAL Summer Program. The Mathematics Proficiency Assessment Tool (MPAT) was used to collect data which were then analyzed descriptively (frequency, percentage, mean, and standard deviation) and inferentially (paired-samples t-test).

The findings indicated that the learners' mathematical achievement had improved significantly. The overall mean score increased from 3.54 (23.60%) in the pre-test to 12.66 (84.40%) in the post-test, representing a mean gain of 9.11 points. Similarly, the mean of operational competence improved significantly from 3.03 to 9.09 and the mean of strategic thinking was 3.54 out of 5 on the post test. The paired-samples t-test indicated a difference between pre-test and post-test scores with a t-value of -25.711 and a p-value $< .001$. The effect size, Cohen's $d_z = 4.124$, suggested a very large effect. The results indicated that Project BOOST was correlated with significant increases in the operational competence and strategic thinking of participating students and offered a foundation for the reinforcement and institutionalization of targeted mathematics intervention.

Keywords: Project BOOST, operational competence, strategic thinking, at-risk learners, Grade 7 mathematics, mathematics intervention

INTRODUCTION

Mathematical proficiency is essential for students to participate effectively in academic and personal experiences and in career and professional situations. Addition, subtraction, multiplication, and division are the four basic arithmetic operations, and are fundamental prerequisites to more advanced mathematical concepts and problem-solving. When students are still weak in these lower-level skills, they may be weaker in the higher-level math skills where computation is increasingly connected with reasoning, problem solving, and abstract thinking.

In the context of Philippine education, the need to address learning issues in mathematics is very apparent. According to Programme for International Student Assessment (PISA) 2022 results, the Philippines received a mean mathematics score of 355, which is significantly lower from the OECD average of 472. Moreover, 16% of Filipino 15-year-old students achieved at least Level 2 in Mathematics, compared to 69% of students



in OECD countries. (OECD, 2023). At Level 2 learners should be able to identify and interpret straightforward mathematical situations and use simple mathematical reasoning. The results therefore reinforce the need to develop competencies for the foundation of mathematical knowledge, and also to be able to use mathematics in meaningful ways, not simply to perform isolated procedures.

A national concern, which is evident in international assessments, can also be seen at the school level. At Zamboanga Sibugay National High School (ZSNHS), some Grade 7 learners identified as at risk continue to experience difficulties in performing fundamental mathematical operations. These difficulties may manifest as reliance on simple counting routines, inadequate fluency with multiplication and division facts, errors with multi-digit multiplication and division facts, or difficulty using previously acquired procedures to solve mathematical problems. The gaps are particularly notable at Grade 7, when students are expected to use computation to reason and solve problems, and when they will encounter more abstract mathematical ideas. Basic arithmetic can take much time, and if sufficient time is spent on this, the student may not be able to visualize how to think through and strategize the mathematical tasks. These challenges cannot be overcome by simply continuing to repeat computational problems. Mathematics teaching and learning involves developing not only procedural skill, but also understanding and flexibility in the use of mathematics. For at-risk learners then, an intervention should provide opportunities to develop competence in the basic computational skills and gradually develop competence in selecting and using appropriate methods, as well as using mathematical procedures in meaningful contexts. It is particularly relevant to grade 7 students who are expected to acquire basic numeracy skills while preparing themselves for the secondary mathematics.

To address this need, a localized intervention for mathematics, Project BOOST (Bridging Outcomes in Operational and Strategic Thinking) was developed. Project BOOST uses a two-way strategy, Operational Thinking (accuracy, fluency and the correct procedures for doing the four basic operations) and Strategic Thinking (choice and use of the correct approach for solving mathematical tasks). The intervention is designed not to consider the two areas of computation as distinct skills, but to relate them together, instead of considering them separately. Learners are offered the chance to practice, consolidate and develop key skills in activities that are structured and targeted for specific areas of practice, and they are given the chance to develop more purposeful and strategic approaches to mathematical tasks through strategically designed activities. Project BOOST is also consistent with the broader purpose to provide responsive educational supports to students at risk of being left behind.

Based on international studies, mathematics is still one of the major learning problems in the Philippines particularly for low performing students. The OECD reports that in PISA 2022, a majority of Filipino students achieved scores in mathematics that were below Level 2, thus, there is a need for focused efforts to improve outcomes in mathematics learning. At the school level, this emphasizes the need for intervention that is responsive to the needs of the student and not the general classroom curriculum.

The study is also relevant to SDG 4 (Quality Education), which aims to ensure inclusive and equitable quality education and promote lifelong learning for all. SDG Target 4.1, specifically, calls for providing access to quality primary and secondary education to all children and achieving equitable and effective learning outcomes. It explicitly includes the percentage of learners performing at low-performance levels in mathematics. SDG Target 4.5 also aims to provide inclusive and equitable and quality education to vulnerable groups. Overall, the implementation of Project BOOST with at-risk Grade 7 students is pertinent to SDG 4, Quality Education, because it provides supplementary support for students requiring extra assistance at the school level who are at risk of not achieving high standards in mathematics. The study therefore translates the abstract notions of quality, equity and inclusive education into a mathematics education intervention at school. Deliberate use of the foundational computational skills and strategic mathematical thinking with localized interventions with learners at risk in grades 7 is both empirically missing and conceptually underdeveloped. Existing remediation efforts may provide opportunities for additional practice in mathematics, but there is limited school-based evidence on approaches that intentionally bridge the development of basic operational skills with the strategic application of those skills during the critical transition to secondary mathematics.

This is particularly important in the local context of ZSNHS, given the existence of basic operations issues

among Grade 7 students entering secondary school. The Project BOOST intervention is specifically designed to address this need and provides a local, structured, and dual operational and strategic focus intervention for the foundation four arithmetic operations. With at-risk Grade 7 students, the use of this is an opportunity to examine the potential for a targeted intervention to address the needs of students to master fundamental mathematical ideas and to prepare students for advanced mathematical thinking. This present study, then, gives empirical evidence for the use of Project BOOST from the school level, which can be utilized in improving the mathematical competence of at-risk Grade 7 students. The study also aligns with the overall objectives of SDG 4, to ensure inclusive and equitable learning opportunities and to foster the development of mathematical skills that enable learners to participate meaningfully in secondary education, especially those who are at risk of being left behind.

Mathematical proficiency goes beyond the ability to get the right answers to problems by memorizing procedures. It includes conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition (Elsayed, 2022). Schulz (2024) likewise emphasized the flexible and meaningful use of mental models, strategies, and procedures, indicating that competence in operations is not limited to executing an algorithm. Strategic thinking complements operational competence because learners need to decide what mathematical act should be performed, in what circumstance, and why. Fuchs et al. (2021) highlighted systematic instruction, mathematical language, representations, and structured opportunities to relate concepts to procedures, while Rojo et al. (2023) underscored the importance of rational-number understanding for later success in secondary mathematics.

The Philippine curricular context further justifies targeted intervention. The MATATAG Curriculum expects Grade 7 learners to apply rational-number skills, the four basic operations, integers, and numerical expressions while developing critical thinking, problem solving, reasoning, and communication (Department of Education, 2023). Evidence from targeted mathematics interventions also indicates positive outcomes when instruction is structured and purposefully designed around learners' needs. Powell et al. (2021) reviewed 72 mathematics intervention studies for middle school students, with 59 showing positive impacts on student-level mathematics outcomes. Recent Philippine studies likewise report continuing difficulties in fundamental operations and numeracy among Grade 7 learners (Cabangon & Bonaobra, 2025; Cusit et al., 2024; Delos Santos et al., 2025; Leviste et al., 2025; Bautista & Dones, 2025).

The reviewed literature suggests that foundational operational skills and strategic application should be addressed together. Previous local interventions have focused on specific operations, numeracy skills, instructional materials, or specific mathematical topics, but not the intentional weaving of operational competence with strategic thinking into one intervention framework. Project BOOST was developed to address this need by connecting Operational Thinking—accuracy, fluency, and correct procedures for the four basic operations—with Strategic Thinking—the choice and use of an appropriate approach for solving mathematical tasks.

Theoretical and Conceptual Basis

The utilization of Project BOOST is grounded in Constructivist Learning Theory (Piaget, 1976), Social Development Theory (Vygotsky, 1978), and Mastery Learning Theory (Bloom, 1968). These theories provide cognitive, social, and instructional bases for active learning, teacher scaffolding and social interaction, and structured practice, feedback, corrective learning, and sufficient learning time. Together, they support the central principle of Project BOOST: connecting Operational Thinking, involving accuracy and fluency in basic mathematical operations, with Strategic Thinking, involving the identification and use of appropriate strategies for mathematical tasks.

The conceptual framework establishes the logical connection between Project BOOST as the intervention and the learner outcomes of operational competence and strategic thinking, measured through pre-test and post-test assessments using the Mathematics Proficiency Assessment Tool (MPAT). The MPAT has two parts: Operational Competence (10 items) and Strategic Thinking (5 items). The assessment results provide the basis for a proposed instructional intervention program.

Research Objectives

This study examined changes in the operational competence, strategic thinking, and overall MPAT performance of at-risk Grade 7 learners following the implementation of Project BOOST at Zamboanga Sibugay National High School.

Specifically, it sought to answer the following questions

1. What are the participants' pretest and posttest scores in terms of (a) operational competence, (b) strategic thinking, and (c) overall MPAT performance?
2. Is there a significant difference between the participants' pretest and posttest scores in (a) operational competence, (b) strategic thinking, and (c) overall MPAT performance following the implementation of Project BOOST?
3. Based on the findings, what instructional intervention program may be proposed to strengthen and sustain mastery of fundamental operations and strategic thinking among at-risk learners?

The hypotheses tested were: H_{01} , there is no significant difference between the participants' pretest and posttest operational competence scores following the implementation of Project BOOST; H_{02} , there is no significant difference between the participants' pretest and posttest strategic thinking scores following the implementation of Project BOOST; and H_{03} , there is no significant difference between the participants' pretest and posttest overall MPAT scores following the implementation of Project BOOST.

Significance

The findings are intended to provide empirical data on the effectiveness of the specific intervention program and to inform numeracy intervention policy, technical assistance, school-level institutionalization, mathematics teaching, learner support, parental support, and future research. The Grade 7 at-risk learners are the main beneficiaries, while the Schools Division Superintendent, Education Program Supervisor in Mathematics, School Head, Mathematics teachers, parents and guardians, and future researchers may use the findings for planning, monitoring, refinement, and further evaluation of mathematics interventions.

METHODS

Research Design and Setting

The research design used in this study was quantitative quasi-experimental research, specifically One-Group Pretest-Posttest Design, to measure the changes in the operational competence and strategic thinking of at-risk students in Grade 7 of a secondary school before and after the implementation of Project BOOST.

This design was chosen because the researcher was able to measure the performance of the participants both before and after the intervention in the natural school environment. Prior to the implementation of Project BOOST, a pre-test was administered to the participants with parental consent to establish their baseline performance in operational competence and strategic thinking. The participants then received the structured intervention activities of Project BOOST during the implementation time. A post-test of similar difficulty and scope was administered following the intervention to assess performance changes. The pre-test and post-test scores were statistically compared to look for any significant difference after the implementation of Project BOOST.

However, because the study utilized only one group and did not include a control or comparison group, the observed changes cannot be attributed solely to Project BOOST. The observed improvement may have been due to other factors, including maturation, prior learning experiences, exposure to other instructional activities, and testing effects. As such, the findings should be interpreted as evidence of the changes that occurred as a result of the implementation of Project BOOST but not as evidence of a causal relationship.

There are also limitations in the design with respect to external validity. The results are not necessarily representative of the overall population of Grade 7 learners or across all other schools and contexts as the

participants were purposefully chosen as learners identified as at risk in the ARAL Summer Program. In spite of these constraints, the design was deemed suitable for the purpose of identifying the pre-intervention and postintervention performance of the identified at-risk learners in the specific school setting.

The study was carried out in Zamboanga Sibugay National High School (ZSNHS), which is located in Barangay Pangi, Municipality of Ipil, Province of Zamboanga Sibugay. The school is a leading secondary school in the division with a diverse population of learners which includes both urban and rural learners in the capital municipality of Ipil.

Participants and Sampling

The study subjects were 35 Grade 7 at-risk learners who were officially identified and listed for participation in ARAL Summer Program of the Zamboanga Sibugay National High School, School Year 2026–2027. The learners selected were identified through the End-of-School-Year (EoS) assessment results based on the Rapid Mathematics Assessment (RMA) which revealed foundational numeracy and mathematical skill challenges. There were only 35 learners officially identified and listed for the ARAL Summer Program hence, all qualified learners were included in the study.

The study was carried out by purposive sampling technique which is a non-probability sampling technique in which the subjects are selected purposefully according to the nature of the study. In particular, the participants were identified as at-risk students in mathematics according to the EoS RMA results and were officially selected as part of the ARAL Summer Program in Grade 7. All 35 identified learners were accessible and the researcher was able to study the intervention with the total number of learners targeted by the program. Because the participants were selected from a specific group of identified at-risk learners and no random sampling or control group was used, the study has limited external validity and the findings should be interpreted within the context of the participating learners and school. The findings are not therefore meant to convey anything generalizable about all grade 7 learners nor to claim generalizability across the study context.

The study included thirty-five (35) learners who had completed Grade 7 and were officially identified as at-risk in Mathematics and included in the ARAL Summer Program. The inclusion criteria consisted of learners who: (1) had completed Grade 7 at Zamboanga Sibugay National High School and were part of the identified target group for the ARAL Summer Program preceding School Year 2026–2027; (2) were identified as at-risk in Mathematics based on their EoS RMA results; (3) demonstrated identified learning needs related to the fundamental operations addressed by Project BOOST; (4) were included in the ARAL Summer Program; (5) obtained informed consent from their parents or legal guardians; and (6) provided their assent to participate in the study. Learners who did not meet the established criteria or for whom the required parental consent and student assent were not obtained were not included in the study.

The study was delimited to thirty-five (35) identified at-risk learners who had completed Grade 7 and did not include the general Grade 7 population, learners from other grade levels, or learners who did not meet the established selection criteria.

Materials and Instrument

The instrument used to collect data in this research is a researcher-created Mathematical Proficiency Assessment, which was designed in a manner that assesses the two aspects of Project BOOST: operational competence and strategic thinking. The instrument is further broken down into two main sections to uncover certain learning gaps. The former is Operational Competence, which is composed of computational items wherein the students are expected to execute the four basic operations of addition, subtraction, multiplication, and division with whole numbers. This part was used to determine the accuracy and fluency of the students in simple arithmetic.

The second part of the tool is devoted to Strategic Thinking, where the use of contextual word problems and multi-step situations is used. As opposed to purely computational tasks, these items demand that students analyze a particular situation, recognize the mathematical operation that should be used to solve the problem

and implement a solution plan. This differentiation is crucial in identifying whether the student is having difficulties because he/she does not know how to calculate or his/her problem-solving reasoning is lacking.

The Mathematics Proficiency Assessment Tool (MPAT) consisted of fifteen (15) items or problems and was developed based on the approved Table of Specifications (TOS). The final instrument retained 10 items for Operational Competence and five items for Strategic Thinking. The content was restricted to addition, subtraction, multiplication, and division, as well as strategic thinking applied to mathematical tasks involving these operations.

Validity, Reliability, and Fidelity

The Mathematics Proficiency Assessment Tool (MPAT) underwent a systematic process of validation and pilot testing prior to its administration to the study participants. The process included expert content validation, formal rating-scale validation, pilot testing, and item analysis. These procedures were undertaken to ensure that the instrument was appropriate for Grade 7 learners and adequately represented the competencies identified in the study, particularly Operational Competence and Strategic Thinking.

The MPAT underwent two phases of expert content validation. During the first phase, the instrument was reviewed by three mathematics education practitioners with relevant academic and professional qualifications. The validators included a Master Teacher with a master's degree in Education major in Mathematics, a Mathematics Department Head who holds a master's degree, and a School Head who holds a Bachelor of Secondary Education major in Mathematics, a master's degree in Mathematics, and a Doctor of Education degree. The validators examined the assessment items in terms of their alignment with the intended competencies and learning objectives, appropriateness of content and level of difficulty, clarity of language, and suitability for Grade 7 learners. Their comments and recommendations were considered in revising the instrument before proceeding to the second phase of validation.

During the second phase, the revised MPAT was subjected to formal content validation using the Content Validity of the Research Instrument – General Evaluation rating scale prescribed by the Graduate Studies office. The validation form evaluates the instrument according to its content and sequence of presentation using a five-point rating scale. The criteria cover the clarity and simplicity of the constructs, their alignment with the research objectives or statement of the problem, their correspondence with the variables under study, the orderly arrangement of the items, and their appropriateness to the content of the research subject.

The second-phase validation was conducted by three qualified members of the oral defense committee. These consisted of the Dean, who served as the panel chairman and holds a Doctor of Education degree, and two other panel members who likewise hold doctorate degrees and possess relevant academic and professional expertise. The completed validation forms reflected favorable evaluations across the prescribed criteria, with the validators consistently indicating agreement regarding the clarity, alignment, organization, and content appropriateness of the instrument.

The recommendations obtained from both phases of validation were considered in refining the instrument. The first phase provided subject-matter review, while the second phase provided additional academic and panel review of the revised instrument. These processes provided a basis for finalizing the MPAT before pilot testing.

Following expert validation, the revised MPAT was pilot-tested with learners comparable to the intended participants but who were not included in the main study. The pilot test was conducted to determine the appropriateness and clarity of the assessment items and to examine their performance before the instrument was used in the actual study.

The pilot-test responses were subjected to item analysis, particularly in terms of item difficulty and discrimination. The difficulty analysis was used to determine whether the items were appropriate in terms of the proportion of learners who could answer them correctly, while the discrimination analysis was used to examine whether the items could distinguish between relatively higher- and lower-performing learners. The results of these analyses were considered together with the competencies and intended difficulty levels

specified in the Table of Specifications. The MPAT was structured to assess 10 items under Operational Competence and five items under Strategic Thinking.

Established decision rules were applied in reviewing the items. Items demonstrating acceptable characteristics were retained, while items requiring attention were examined for possible revision. Item decisions were not based solely on statistical characteristics; the relevance of each item to the intended competency, clarity of wording, appropriateness for the target learners, and consistency with the Table of Specifications were also considered.

The results of the pilot testing and item analysis provided a basis for reviewing and refining the assessment items. Items that demonstrated satisfactory characteristics were retained, while items requiring improvement were revised to enhance their clarity, appropriateness, and alignment with the intended competencies. The instrument was also reviewed for accuracy and consistency of its answer key.

The revisions were incorporated into the final version of the MPAT before its administration to the study participants. The final instrument retained its intended structure of 10 items for Operational Competence and five items for Strategic Thinking, consistent with the Table of Specifications.

The reliability of the MPAT was addressed through the pilot-testing and item analysis process conducted before the main administration. The pilot test responses were examined to identify items that performed appropriately and contributed to the overall quality of the assessment. The review of item difficulty and discrimination, together with the expert validation and subsequent revisions, provided a basis for determining the suitability of the items for the final instrument.

The finalized MPAT was therefore considered appropriate and sufficiently consistent for use in the main study. The validation, pilot testing, and item-analysis procedures provided a systematic basis for ensuring that the instrument was aligned with the intended competencies and suitable for assessing the participants' Operational Competence and Strategic Thinking.

To ensure that Project BOOST was implemented in accordance with the planned intervention, intervention fidelity was monitored throughout the implementation period. Fidelity was documented through the attendance sheets and session records, which provided evidence of learner participation and implementation of the scheduled intervention sessions.

Project BOOST was implemented over 15 days, with each session lasting 60 minutes per day, for a total planned instructional dosage of 900 minutes or 15 hours. The intervention involved the 35 identified Grade 7 at-risk learners who participated in the scheduled Project BOOST sessions. Learner attendance was recorded for each intervention session through the attendance sheets maintained during the implementation period.

The attendance records documented learner participation across the scheduled intervention dates. These records were used to monitor adherence to the planned intervention schedule and instructional dosage. The intervention sessions were conducted according to the planned schedule, and there were no documented deviations from the planned Project BOOST program sessions. No cancellations, changes in the planned session sequence, or modifications to the scheduled intervention were recorded during the implementation period.

Overall, the intervention fidelity records indicated that the planned 15-day, 60-minute-per-day Project BOOST implementation was followed throughout the intervention period. The documented attendance and absence of recorded deviations provided implementation evidence that the intervention was delivered according to its planned schedule and dosage.

Procedure and Data Collection

The data gathering procedure followed a sequence beginning with institutional and ethical approval, participant recruitment and consent, baseline assessment, intervention implementation, post-intervention



assessment, data protection, and statistical analysis. The sequence was aligned with the School Year 2026–2027 and the implementation schedule of the ARAL Summer Program.

Phase 1: Institutional Approval, Ethical Clearance, and Participant Consent

The researcher first obtained ethical clearance from the Universidad de Zamboanga Research Ethics Committee (UZ-REC). After ethical approval, formal administrative permission was secured from the Schools Division Superintendent of Zamboanga Sibugay through the School District Supervisor of Ipil and subsequently from the School Head of Zamboanga Sibugay National High School.

Following institutional approval, informed consent forms were provided to the parents or legal guardians of the identified Grade 7 ARAL learners. The purpose, scope, procedures, voluntary nature, potential benefits, and minimal risks of the study were explained. Student participants were also provided with developmentally appropriate assent forms. Only learners with the required parental consent and student assent proceeded to the study.

Phase 2: Baseline Assessment

After the required approvals and consent procedures had been completed, the baseline MPAT was administered to the participating learners before the implementation of Project BOOST. The assessment measured their initial performance in Operational Competence and Strategic Thinking.

The scores obtained during this phase established the learners' baseline performance and served as the reference point for the subsequent comparison with their post-intervention performance.

Phase 3: Implementation of Project BOOST

Following the baseline assessment, Project BOOST was implemented as the structured remedial intervention.

The intervention was implemented over 15 days, with 60 minutes per session, according to the approved Project BOOST implementation plan. The intervention focused on identified learning needs in operational competence and strategic thinking and incorporated the planned learning activities, instructional procedures, practice opportunities, feedback, corrective instruction, and reassessment.

Learner attendance, session completion, and implementation of the planned instructional components were documented throughout the intervention. Any deviations from the planned schedule or procedures were recorded and considered in interpreting the implementation of the intervention.

The researcher monitored learners for signs of cognitive fatigue, emotional discomfort, or distress throughout the intervention and followed the approved distress protocol whenever necessary.

Phase 4: Post-Intervention Assessment

Following the completion of the 15-day Project BOOST intervention, the posttest was administered to the same group of participants. The same 15-item Mathematics Proficiency Assessment Tool (MPAT) used during the pretest was administered again as the posttest. The MPAT measured the participants' performance in the two study domains, namely Operational Competence and Strategic Thinking.

The use of the same assessment instrument allowed the researcher to obtain directly comparable measurements of the participants' performance at the two assessment points. The posttest scores were paired with the corresponding pretest scores of the same participants to facilitate the statistical analysis of the observed pretest-posttest differences.

Because the same 15-item MPAT was administered twice, the possibility of a testing or practice effect was acknowledged. Participants may have become familiar with the content or format of the assessment through the pretest administration, which could have contributed to their performance during the posttest. This

limitation was considered in the interpretation of the findings, particularly because the study employed a one-group pretest-posttest design without a control or comparison group.

Phase 5: Data Protection and Management

Following the completion of data collection, the pretest and posttest results were tabulated and coded to protect the identity of the participants during data processing, analysis, and reporting. Participant information was treated confidentially, and identifying information was not included in the presentation or reporting of the study findings. This procedure was consistent with the approved research protocol, which provided for the anonymization of collected data for analysis and reporting.

Access to the collected research data was limited to the researcher and authorized persons involved in the approved research process. The data were used solely for the purposes specified in the research protocol and were handled in accordance with the applicable institutional research ethics and data-protection requirements.

The research records were retained in accordance with the approved institutional requirements and the conditions of the research ethics protocol. Upon completion of the required retention period, the research records were to be disposed of through a secure disposal procedure consistent with the University's approved research ethics and data-protection requirements, ensuring that the confidentiality and privacy of the participants were maintained.

Researcher's Role and Ethics

The researcher served as the facilitator of the Project BOOST intervention and was also responsible for administering the MPAT, recording the assessment results, monitoring intervention implementation, and processing the collected data. Due to the researcher's active role in the intervention and assessment processes, researcher expectancy and implementation bias were recognized. This was minimized by using standardized administration and scoring procedures. Assessment instructions, scoring guidelines and data recording procedures were the same across participants and assessment periods. The researcher also kept the intervention and assessment records to provide documentation of the implementation process.

The researcher has ensured the ethical and scientific soundness of the study by following ethical principles that safeguard the rights, dignity, privacy, anonymity and general welfare of all participants. The researcher had prepared and submitted the required documents for ethical review and clearance from the University Research Ethics Committee (REC) prior to the data collection. Ethical clearance was obtained and formal administrative clearance was secured from the Schools Division Superintendent of Zamboanga Sibugay via Schools District Supervisor of Ipil and then from the School Head of Zamboanga Sibugay National High School for institutional authorization and compliance.

Parental consent and student assent were obtained to ensure voluntary participation. Parents/legal guardians of identified at-risk learners were given a Signed Informed Consent Form that outlines the purpose of the study, the nature of the Project BOOST intervention, the benefits of their participation, and the minimal risks of their participation. The students were also given an Assent Form, written in an age-appropriate manner, to make sure that they understood the study that they were participating in. The parents/legal guardians and students were advised that participation was optional and that withdrawing from the study would not result in any academic or negative consequences.

To reduce the psychological and cognitive load on the children during data collection and intervention sessions, a distress protocol was employed. The researcher observed any signs of cognitive fatigue, confusion, discomfort or emotional distress. If a participant exhibited distress, the assessment or intervention session with that participant was discontinued or paused. The participant was given sufficient time to recover, and the session was resumed only if the participant voluntarily chose to continue and it was considered appropriate to do so. When continuing participation was not in the best interest of the participant, the session was ended.

The confidentiality and anonymity of the participants were maintained through appropriate data-protection procedures. Physical and electronic research data were stored securely and were accessible only to the researcher and other authorized persons, as appropriate within the approved research protocol, including pre-test and post-test records. Participants' information has been coded with alphanumeric identifiers to reduce the risk of identifying participants during the processing, analysis, and reporting of the data. The results of the research were not shown or published with personal identifying information.

Research records will be kept and disposed of in the manner approved by the University Research Ethics Committee and in line with institutional data-privacy requirements. The one group pre-test/post-test design was applied in a non-invasive and educationally appropriate way. The researcher ensured that the conduct of the study provided a safe, supportive, and respectful learning environment and reasonable precautions were taken to prevent physical, psychological, or undue academic harm to the participants.

Data Analysis

The coded paired pretest and posttest scores were analyzed using descriptive and inferential statistics. Normality was assessed for the pretest–posttest difference scores using the Shapiro–Wilk test. Because the operational competence and strategic thinking difference scores were non-normal, Wilcoxon signed-rank tests were used for these domains, with rank-biserial correlation as the effect-size measure. Because the overall MPAT difference scores did not significantly depart from normality, a paired-samples t-test was used for the overall score, with Cohen's d_z as the effect-size measure. All hypothesis tests used $\alpha = .05$.

The collected data were analyzed using descriptive and inferential statistics to examine the participants' pretest and posttest performance following the implementation of Project BOOST. Descriptive statistics were used to summarize performance in Operational Competence, Strategic Thinking, and overall MPAT performance, while inferential statistics were used to determine whether statistically significant differences existed between the paired pretest and posttest scores.

The mean was calculated to describe the participants' performance in Operational Competence, Strategic Thinking, and overall MPAT performance at pretest and posttest. It was also used to describe the observed change in participants' scores between the two assessment points. The standard deviation (SD) was computed to describe the variability or spread of participants' scores around the mean.

For inferential analysis, the statistical test was selected based on the distribution of the pretest–posttest difference scores. The normality of the difference scores for Operational Competence, Strategic Thinking, and overall MPAT performance was assessed using the Shapiro–Wilk test.

The difference scores for Operational Competence and Strategic Thinking did not meet the normality assumption; therefore, the Wilcoxon signed-rank test, a nonparametric test appropriate for paired observations, was used to determine whether statistically significant differences existed between the pretest and posttest scores for these two domains. For the overall MPAT score, the difference scores did not significantly depart from normality; hence, the paired-samples t-test was used to examine the difference between the paired pretest and posttest scores.

For the Wilcoxon signed-rank tests, rank-biserial correlation was used as the effect-size measure, while Cohen's d_z was used for the paired-samples t-test. These effect-size measures were reported alongside the significance tests to describe the magnitude of the observed pretest–posttest differences.

All inferential tests were evaluated at an alpha level of 0.05. The null hypothesis was rejected when the obtained p-value was less than 0.05 and not rejected when the p-value was greater than or equal to 0.05. The results were interpreted based on the statistical significance and direction of the pretest–posttest differences, with effect sizes considered to provide additional information about the magnitude of the observed changes.

RESULTS

Data Validation and Statistical Approach

There were 35 different participant IDs in the revised data set that had full paired data for both pre-test and post-test. All Operational Thinking scores were within the possible range of 0–10, while Strategic Thinking scores ranged from 0–5. Overall MPAT scores were obtained by adding the two components and ranged from 0–15. No missing paired observations or duplicate participant IDs were found.

Table 1. Normality and Appropriate Test Decisions

Difference Score	Shapiro–Wilk W	p-value	Decision	Primary Test	Rationale
Operational Thinking	0.927	0.023	Non-normal	Wilcoxon signed-rank	$p < .05$
Strategic Thinking	0.92	0.015	Non-normal	Wilcoxon signed-rank	$p < .05$
Overall MPAT	0.964	0.304	Normal	Paired-samples t-test	$p > .05$

Prior to conducting the inferential analysis, the normality of the pre-test–post-test difference scores were assessed using the Shapiro–Wilk test at the 0.05 level of significance. This approach was justified because the study was a paired pre-test–post-test design, where the normality of the difference scores supports the use of the parametric paired-samples t-test. Results revealed that the Operational Thinking difference scores were not normally distributed ($W = 0.927$, $p = .023$) and the Strategic Thinking difference scores were also not normally distributed ($W = 0.920$, $p = .015$). With both p-values below .05, the assumption of normality was not met for these 2 components. As a result, the Wilcoxon signed-rank test, a nonparametric alternative to the paired observations test, was chosen for analysis of Operational and Strategic Thinking.

In contrast, the Overall MPAT difference scores did not significantly depart from normality, $W = 0.964$, $p = .304$. The p value was greater than .05, so the normality assumption was accepted, and the paired-samples t-test was used to test the hypothesis that there was no difference between the pre-test and post-test Overall MPAT scores. These findings were used to help determine the most suitable inferential statistical test for each variable. Thus, the analysis used the Wilcoxon signed-rank test for Operational and Strategic Thinking and the paired-samples t-test for the Overall MPAT scores.

Pretest and Posttest Performance

Table 2. Pretest and Posttest Scores in Operational Competence, Strategic Thinking, and Overall MPAT

Measure	Maximum Score	Pretest Mean	Pretest SD	Pretest Range	Posttest Mean	Posttest SD	Posttest Range	Mean Gain
Operational Competence	10	3.03	1.27	0–5	9.09	1.07	6–10	6.06
Strategic Thinking	5	0.66	1.08	0–5	3.54	1.22	1–5	2.89
Overall MPAT	15	3.69	1.51	1–6	12.63	1.42	10–15	8.94

Note. Operational Thinking consisted of 10 items and Strategic Thinking consisted of 5 items. Overall MPAT was the sum of both domains.

Table 2 shows the participants' performance in Operational Thinking, Strategic Thinking, and Overall MPAT before and after Project BOOST was implemented. Overall, there is a significant improvement on all three measures. The mean score for the participants grew from 3.03 points in the pre-test to 9.09 points in the post-test, which represents a mean gain of 6.06 points in Operational Thinking. The range of scores also changed from 0–5 to 6–10, which shows that the participants' performance in basic mathematical operations was significantly improved following the intervention.

This improvement aligns with the intervention literature of Lariviere, Powell, and Akther (2024), whose work emphasizes the importance of structured and targeted approaches to addressing the mathematics difficulties of learners. The mean score for Strategic Thinking went up from 0.66 out of 5 to 3.54, which represents a mean gain of 2.89 points. The score scale also got better and better, from 0-5 to 1-5. The substantial increase suggests that the participants made meaningful progress in applying mathematical strategies in addition to performing basic computations. This is aligned with Schulz (2024), who noted that procedural fluency and strategic competence in Mathematics are connected. This outcome is important for Project BOOST, as the intervention was intended to reinforce basic operations while teaching learners to apply these operations to solve problems.

The improvement also was seen in the Overall MPAT, with a mean score rising from 3.69 out of 15 to 12.63 producing a mean gain of 8.94 points. In percentage terms, the mean performance increased from approximately 24.60% to 84.20%. The score range went from 1–6 on the pre-test to 10–15 on the post-test, indicating a significant increase in the overall mathematical performance. This trend aligns with the research conducted and aggregated by Powell et al. (2021) which offer evidence from targeted mathematics interventions that can positively influence learner outcomes.

The results overall show that the participants demonstrated gains in both Operational Thinking and Strategic Thinking with corresponding gains in their overall MPAT performance. The increase in absolute gains for Operational Thinking (6.06) is predicted as it contains 10 items compared to 5 items for Strategic Thinking. Most importantly, the gains observed in both domains suggests that the improvements were not limited to computation performance but also to the strategic performance of mathematical tasks. These descriptive findings are used as the foundation for the subsequent analysis of statistical significance of the difference between the pre-test and post-test scores.

Differences Between Pre-test and Post-test Scores

Table 3. Wilcoxon Signed-Rank Tests for Operational and Strategic Thinking

Domain	Pretest Mean	Posttest Mean	Positive / Zero / Negative	W	p-value	Rank-biserial Effect	Remarks	Decision on H ₀
Operational Competence	3.03	9.09	35 / 0 / 0	0.00	< .001	1.000 — very large	Significant	Reject H ₀
Strategic Thinking	0.66	3.54	32 / 2 / 1	2.50	< .001	.991 — very large	Significant	Reject H ₀

Note. Positive / Zero / Negative indicates the number of participants whose post-test score increased, remained unchanged, or decreased. Both domain-level distributions of paired differences were non-normal; hence Wilcoxon signed-rank tests were used.

Table 3 presents the results of the Wilcoxon signed-rank tests conducted to determine whether a significant difference existed between the participants' pre-test and post-test scores in Operational Thinking and Strategic Thinking following the implementation of Project BOOST. The Wilcoxon signed-rank test was employed because the paired differences data for both domains were not normally distributed.

For Operational Thinking, the mean score increased from 3.03 in the pre-test to 9.09 in the post-test. All 35 participants obtained higher post-test scores, with no zero or negative changes. The test result was a W test statistic of 0.00 with a p-value of < .001 which indicated that there was a statistically significant difference between the pre-test and post-test scores. The rank-biserial effect size of 1.000 represents a very large magnitude of change. Thus, the participants demonstrated a statistically significant and substantial improvement in Operational Thinking following the intervention.

The mean score for Strategic Thinking items rose from 0.66 to 3.54 after the intervention. Of the 35 participants, 32 showed improvement, 2 showed no change, and 1 showed a decrease. The Wilcoxon test

yielded a W test statistic of 2.50 and a p value of $< .001$, indicating a significant difference between the two assessments. The rank-biserial effect size of .991 indicates a very large magnitude of change. The result is particularly relevant to the purpose of Project BOOST, which was designed to develop learners' performance beyond basic computation toward the application of mathematical strategies. Overall, both domains demonstrated statistically significant change, and very large effect sizes after Project BOOST was implemented.

The findings are then sufficient to support the rejection of the null hypotheses for both Operational Thinking and Strategic Thinking. The rank-biserial effect sizes were also very large, suggesting that the observed changes were not just statistically but also in magnitude. The findings are also statistically substantiating the descriptive improvements detailed in the previous analysis.

Table 4. Paired-Samples t-Test for the Overall MPAT Score

Comparison	Pretest Mean	Posttest Mean	Mean Difference	95% CI	t	df	p-value	Cohen's dz	Decision on H_0
Overall MPAT	3.69	12.63	8.94	8.20–9.69	24.397	34	$< .001$	4.124 — very large	Reject H_0

Note. The difference was calculated as post-test minus pre-test, so a positive mean difference indicates improvement. SPSS output should be reported as $p < .001$ rather than $p = .000$.

Table 4 presents the results of the paired-samples t-test conducted to determine whether there was a significant difference between the participants' overall pre-test and post-test MPAT scores following the implementation of Project BOOST. The participants' mean score increased from 3.69 in the pre-test to 12.63 in the post-test, resulting in a mean difference of 8.94 points. The 95% confidence intervals for the mean difference were all positive at 8.20-9.69, so there was a consistent improvement for those participating. The paired-samples t-test yielded a t test statistic of 24.397 with 34 degrees of freedom and a p-value of $< .001$. Since the p-value is below the .05 level of significance, the difference between the pre-test and post-test overall MPAT scores is statistically significant.

This is enough to conclude that the null hypothesis is rejected, meaning that there is significant difference between the pre-test and post-test. In addition to the statistical significance, the Cohen's dz of 4.124 suggests a very large effect size, suggesting that the magnitude of the change was significant. This boost in overall MPAT performance was thus statistically significant and quite substantial. The findings indicate that a pronounced change in the participants' overall mathematical proficiency occurred following the implementation of Project BOOST. These findings are similar to the domain-level results in Table 3, which also showed very large effect sizes for both Operational Competence and Strategic Thinking. Combined, the results constitute converging evidence that there was a significant improvement in the participants' mathematical performance following the intervention.

Proposed Instructional Intervention

Table 5 presents the proposed Project BOOST Institutionalization and Enhancement Plan, developed based on the findings of the study. The plan is to continue the improvement the participants have shown and to develop further skills that were not addressed, such as Strategic Thinking. The intervention is not a stand-alone activity but specific steps are included to integrate Project BOOST into existing mathematics intervention practices. Strategic Thinking was identified as the primary area for improvement as its mean score in the post test (3.54 out of 5) was significantly lower than its Operational Competence mean score (9.09 out of 10) despite being a considerable improvement. Hence, this plan suggests to include more multi-step, non-routine, reasoning, estimation, and solution-explanation tasks in Project BOOST sessions. A minimum of 80% mean mastery is a measurable basis for monitoring continued improvement in this domain.

The post-test mean of 9.09 out of 10 in Operational Mastery shows significant improvement following the

intervention. The proposed plan therefore focuses on maintaining teaching and learning methods that led to this performance, such as explicit teaching, worked examples, guided practice, retrieval, and feedback. The plan does not aim to replace these practices, but to continue them over the next few cycles of BOOST, aiming to achieve a mean mastery of at least 85%.

Learner Differentiation is also included in the plan as a result of observing individual patterns. Although most participants improved in Strategic Thinking, one participant showed a decline and two showed no change. This means that aggregate improvement will not necessarily address the needs of all learners. The proposed plan for using item-level diagnostic review and targeted small group or individual remediation offers a way to identify learners who will benefit from additional support. The effectiveness of these differentiated interventions will be measured through follow up gains among flagged students within these interventions.

Another important part of the plan is Progress Monitoring. The results indicated a high overall mean gain (8.94) which indicated significant improvement however this needs to be monitored to establish whether this is maintained. Based on this, the plan recommends a shared pre-test, a mid-testing, a post-test, and a delayed retention assessment for each cohort. A retention assessment, conducted four to six weeks following the intervention, is especially significant, as it will enable the mathematics department to identify whether or not the improvement in mathematics performance persists after the post-test.

The proposed Program Institutionalization component aims to embed Project BOOST within the ongoing school mathematics intervention. The statistically significant overall improvement ($p < .001$) provides empirical support for continuing the program within the school context. Institutionalization would mean Project BOOST would be embedded in the mathematics intervention policy, annual implementation planning, resource allocation, and teacher development activities. This can help to ensure continuity of intervention, not just one implementation cycle.

Overall, the proposed plan converts the empirical outcomes of the study into an intervention framework for a sustainable school-based intervention. It maintains the instructional approaches correlated with good gains in learning, expands opportunities for strategic thinking, offers ongoing support to those who still need it, creates a systematic process for progress monitoring, and enhances future assessment. Project BOOST can be expanded from a time-limited intervention into a more systematic and sustainable portion of math support for at-risk students.

Table 5. Proposed Project BOOST Institutionalization and Enhancement Plan

Priori ty Area	Evidence Basis	Recommended Action	Respons ible Unit	Success Indicator	Schedule
Strate gic Think ing	Post-test mean = 3.54/5; lower than Operational Thinking	Increase multi-step, non-routine, reasoning, estimation, and solution-explanation tasks within every BOOST session.	Mathem atics teachers; departme nt head	At least 80% mean mastery and fewer students with unchanged/declini ng scores	Next implementat ion cycle
Opera tional Maste ry	Post-test mean = 9.09/10; very large improvement	Retain explicit instruction, worked examples, guided practice, retrieval exercises, and immediate feedback.	Mathem atics teachers	Maintain at least 85% mean mastery	Every BOOST cycle
Learn er Differ entiati on	One student declined and two showed no strategic gain	Use item-level diagnostic review and provide targeted small-group or individual remediation.	Teacher; guidance /learning support	All flagged students demonstrate positive follow-up gain	Within 2 weeks after post-test



Progress Monitoring	Strong overall gain of 8.94 points	Adopt common pretest, midpoint check, post-test, and delayed retention assessment.	Mathematics department	Complete score records and retention evidence for every cohort	Beginning each cycle; retention check after 4–6 weeks
Program Institutionalization	Significant overall improvement, $p < .001$	Include Project BOOST in the mathematics intervention policy, annual implementation plan, resource allocation, and teacher development agenda.	School head; mathematics department	Approved guideline, schedule, materials, and monitoring report	Within the school year
Evaluation Strengthening	One-group design limits causal inference	For future cycles, use a matched comparison group where feasible and document attendance, dosage, and implementation fidelity.	Research coordinator; school head	Comparative evaluation and fidelity report completed	Next formal evaluation

DISCUSSION

Interpretation of Findings

The findings show improvement in both operational and strategic dimensions of mathematical performance. The increase in Operational Thinking is consistent with literature emphasizing structured and targeted approaches to mathematics difficulties (Lariviere et al., 2024). The increase in Strategic Thinking is consistent with Schulz (2024), who noted that procedural fluency and strategic competence in Mathematics are connected. The overall improvement is also consistent with the evidence synthesized by Powell et al. (2021), which supports targeted mathematics interventions for learners with mathematics difficulties.

The results further support the premise of Project BOOST that operational competence and strategic thinking should be addressed together. The intervention was designed to reinforce basic operations while teaching learners to apply these operations to mathematical tasks. The findings therefore provide school-level evidence that a structured intervention combining foundational computation and strategic application can be used with at-risk Grade 7 learners, while the limitations of the design require cautious interpretation of the observed changes.

Implications and Proposed Intervention

The proposed Project BOOST Institutionalization and Enhancement Plan emphasizes Strategic Thinking as the primary area for further development, while maintaining the instructional practices associated with improved Operational Mastery. It recommends more multi-step, non-routine, reasoning, estimation, and solution-explanation tasks; continued explicit instruction, worked examples, guided practice, retrieval exercises, and immediate feedback; item-level diagnostic review and targeted remediation; common pretest, midpoint check, post-test, and delayed retention assessment; institutional integration into mathematics intervention planning; and stronger evaluation designs in future cycles.

LIMITATIONS

Despite the defined scope and systematic implementation of the intervention, several methodological limitations should be considered when interpreting the findings. First, the use of a One-Group Pretest–Posttest Design without a control or comparison group limits the extent to which the observed changes can be attributed exclusively to Project BOOST. Other factors occurring during the study period, such as maturation, history, prior exposure to similar materials, or other learning experiences, may have contributed to changes in performance. Because the same MPAT was administered at pretest and posttest, a testing or practice effect is also possible, as familiarity with the assessment items or format may have influenced posttest performance.



Second, the participants were selected through purposive sampling and consisted of only 35 learners from a single school. Although all qualified learners identified for the ARAL Summer Program were included, the sample was specific to the targeted at-risk population and was not randomly selected from the broader Grade 7

population. Consequently, the findings have limited external validity and should be interpreted within the context of the participating learners, school, and ARAL Summer Program. The findings should not be generalized to all Grade 7 learners or to learners in other schools or educational settings without further supporting evidence.

Third, the study was conducted within the 15-day implementation period of the ARAL Summer Program. This relatively short period allowed the study to examine immediate pretest–posttest changes but did not establish whether the observed gains were sustained over a longer period. The study therefore did not determine the participants' long-term retention or transfer of the targeted competencies beyond the intervention period.

Finally, the researcher served as the facilitator of the intervention and was also involved in assessment administration, monitoring, and data processing. Although standardized administration, scoring, and documentation procedures were used, the researcher's direct involvement may introduce researcher expectancy or implementation bias. These limitations were considered when interpreting the results and should be taken into account in evaluating the strength and applicability of the findings.

Additional considerations include possible testing or practice effects from use of the same MPAT, maturation and historical factors, regression toward the mean, the limited number of MPAT items, and potential researcher expectancy, implementation fidelity, and participant reactivity. These considerations do not negate the observed changes but should be taken into account when interpreting the findings.

CONCLUSION

The participants were able to obtain higher posttest scores than pretest scores in Operational Competence, Strategic Thinking and overall MPAT scores. The improvements were significant across all three areas measured in the study. The posttest revealed that learners' performance was higher in Operational Competence and comparatively lower in Strategic Thinking. This indicates that although progress was made in fundamental mathematical operations, there is still a need to develop strategic thinking skills that will enable learners to think through problems and use appropriate strategies.

There was a significant difference between the participants' pretest and posttest scores in Operational Competence, Strategic Thinking, and overall MPAT performance. Thus, the null hypotheses stating that there is no significant difference between the participants' pretest and posttest scores in Operational Competence (H_{01}), Strategic Thinking (H_{02}), and overall MPAT performance (H_{03}) are rejected. Across all three measures, the participants' performance was significantly better in the posttest. The results of this study, however, cannot be attributed to Project BOOST alone because it was a one-group pretest–posttest design. Findings, therefore, are interpreted in the context of the participants and the setting of the study to support the on-going implementation, monitoring and further evaluation of the intervention.

Based on the findings, an instructional intervention program may be proposed to strengthen and sustain learners' mastery of fundamental operations and strategic thinking. The proposed program shall continue to support Operational Competence and strengthen Strategic Thinking via differentiated learning activities and continued practice. Future implementation could also incorporate retention and fidelity monitoring, as well as more robust comparative designs, to gain further evidence of consistency and sustainability of the observed gains.

RECOMMENDATIONS

The Schools Division Superintendent is encouraged to ensure that the continued pilot implementation and monitored expansion of research-based mathematics interventions, like Project BOOST, be provided in

schools where there are persistent difficulties with fundamental operations for learners. Systematic monitoring of learner outcomes, implementation fidelity, resource needs, and teacher support could be continued while continued implementation is considered. Based on the favorable learner outcomes in subsequent cycles of implementation, the intervention may be recommended for scale-up in relevant schools with support from technical assistance, instructional materials, and relevant professional development.

The Education Program Supervisor in Mathematics is encouraged to offer technical assistance and instructional support to schools that have adopted a mathematics intervention program, including in the areas of fundamental operations and strategic thinking. The EPS in Mathematics can contribute to the sharing of effective practices for intervention, monitoring, and experiences of implementation across various schools to help continuously improve the program. Findings from future implementation cycles may also be examined to assess whether successful interventions like Project BOOST provide robust and replicable results to support wider adoption or scaling up. These decisions should be based on systematic tracking of learner progress, fidelity of implementation, and on the results of more robust comparative evaluations when available.

The School Head is encouraged to continue Project BOOST on a pilot and monitored basis for learners who show difficulties with basic operations. The school may implement a systematic cycle of diagnostic assessment, intervention, progress monitoring, post assessment and subsequent assessment to further determine maintenance of gains over time. The School Head may also provide for proper scheduling, teaching materials, teacher collaboration and documentation of absences and participation of the learners. Results of implementation cycles should be analyzed to assess if the program needs to be adjusted, extended or investigated for potential expansion in the school.

Mathematics teachers are encouraged to integrate both operational and strategic thinking into intervention and regular mathematics instruction. Instruction should further build accuracy and fluency in the basic operations and gradually present students with multi-step problems, choices of strategies, estimation, explaining solutions, and checking the reasonableness of their answers. Formative and diagnostic assessment should be conducted regularly to determine specific learning gaps and to offer differentiated remediation. Teachers are also encouraged to record the learner progress and implementation experiences for continuous improvement of Project BOOST.

Students identified as needing mathematics intervention in grades 7 are encouraged to actively complete intervention activities and consistently practice fundamental operations and strategic problem solving. Students should be encouraged to articulate their mathematical thinking, experiment with possible strategies, learn from mistakes and ask for help when needed. Their progress should be measured during the intervention, and continued participation and practice may help build and consolidate both operational competence and strategic thinking.

Parents and guardians are encouraged to foster the learners' mathematics development by offering opportunities for regular practice at home and in simple real-life contexts. They might observe the process of the task being completed, encourage perseverance, and elicit the learner to explain not only how but why they reached a solution. Coordination with teachers may also be encouraged when learners continue to experience difficulties so that appropriate support can be provided.

Future researchers are encouraged to replicate and extend Project BOOST with larger and more diverse samples in various educational settings and schools to see if the effects that were observed in the present study are replicable beyond this study context. Future studies should use more rigorous comparative designs, such as a randomized controlled design if possible, or an appropriate quasi-experimental design with a matched comparison or control group, to provide a stronger case for the effectiveness of Project BOOST and to overcome the limitations of the one group pretest–posttest design. Researchers may also follow-up with the intervention over a longer timeframe to see if the gains in operational competence and strategic thinking are maintained. A delayed posttest can be employed to evaluate retention, and a transfer task can be used to check if the skills the learner has acquired can be transferred to other math problems and situations. Future assessments should also include details about intervention dosage, implementation fidelity, and the



relationship between specific intervention components and observed gains in Project BOOST. Evidence gathered from multiple cycles of implementation can then guide decisions about refining, maintaining, and/or expanding the intervention.

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